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EXAMINER	
KEBEDE, BROOK	
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/627,753	LEE ET AL.
	Examiner	Art Unit
	Brook Kebede	2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 12 October 2004.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-26 and 28-40 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) 23 is/are allowed.

6)☒ Claim(s) 1-22,24-26,28-35 and 37-40 is/are rejected.

7)☒ Claim(s) 36 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 12/8/04.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 9, 10, 11, 33, 34, and 35 objected to because of the following informalities:

Claims 9, 10, 11, 33, 34, and 35 use an open-ended phrase "comprises" in the Markush group of claim. However, such use is improper. *It is improper to use the term "comprising" instead of*

"consisting of." See *Ex parte Dotter*, 12 USPQ 382 (Bd. App. 1931). Appropriate correction is required.

Specification

2. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required:

Claim 23 recites "The method of claim 1, wherein said implanting said dopant is performed after said implanting said at least one species, said method further comprising annealing said substrate after said implanting said species and before said implanting said dopant" in lines 1-4.

Although, the specification provides support for "implanting said dopant is performed after said implanting said at least one species," as shown in Figs. 5A and 5B and Pages 19 and 20 of the instant application, the specification does not provide support for "annealing said substrate after said implanting said species and before said implanting said dopant." Therefore, the specification is objected to as failing to provide proper antecedent basis for the claimed subject matter.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-6, 9-12, 18-22, 24, 25, 30, 34, 35, 37, 39, and 40 are rejected under 35 U.S.C. 102(b) as being anticipated by Talwar et al. (US/6,380,044).

Re claims 1, 34, and 37, Talwar et al. disclose a method of forming a semiconductor device, comprising: implanting a dopant (i.e., p-type dopant or n-type dopant such as boron or arsenic) (see Col. 7, line 64 – Col. 8, lines 20) to form a dopant extinction region (see Figs. 11A-1E), and implanting at least one species (i.e., such Ge, Si, Ar, Xe, etc.), on a substrate to form a region surrounding at least a portion of the dopant extension region (see Fig. 1B and Col. 7, line 47-Col. 8, line 50) on a semiconductor substrate (10), and annealing the substrate (see Fig. 1F and 1G), said at least one species retarding a diffusion of the dopant during the annealing step of the substrate (i.e., the amorphous region crated in the substrate **10** by species **48** , See Fig 1B, i.e., species such as Ge, Si, In, Ar, Xe, ... dopant and by species **70**, see Fig. 1E, i.e., species such as Ge, Si, In, Ar, Xe, ... prohibits diffusion of the source drain dopant, i.e., B or As, into the channel region as shown in Figs 1F and 1G,), wherein the dopant the species, i.e., such Ge, Si, Ar, Xe, etc., is different from the dopant, i.e., such as boron (see Figs. 1A-1G, 2 and 3A-3C).

Re claim 2, as applied to claim 1 above, Talwar et al. teach all the claimed limitation including the limitation wherein a dosage of the at least one species exceeds a preamorphization threshold of the substrate (i.e., the disclosed range $1x10^{13}$ to $1x10^{16}$ atoms/cm^2 encompasses the

claimed limitations that is dose of species such as Ge, Si, In Ar, Xe, ... exceeds $1x10^{14}$ ions/cm^2 for Xe and $1x10^{15}$ ions/cm^2 for Si, as example provided in the specification of instant application Page 14, lines 1-6) (see Col. 7, lines 53-67).

Re claim 3, as applied to claim 1 above, Talwar et al. teach all the claimed limitation including the limitation wherein a dosage of the at least one species comprises at least about 3 times the preamorphization threshold of the substrate (i.e., dosage $3x10^{14}$ ions/cm^2 for Xe and $3x10^{15}$ ions/cm^2 for Si) (see Col. 7, lines 53-67).

Re claim 4, as applied to claim 1 above, Talwar et al. teach all the claimed limitation including the limitation wherein a dosage of the at least one species is at least about 5 times the preamorphization threshold of the substrate (i.e., $5x10^{14}$ ions/cm^2 for Xe and $5x10^{15}$ ions/cm^2 for Si) (see Col. 7, lines 53-67).

Re claim 5, as applied to claim 1 above, Talwar et al. teach all the claimed limitation including the limitation wherein a dosage of the at least one species is at least about 7 times the preamorphization threshold of the substrate (i.e., $7x10^{14}$ ions/cm^2 for Xe and $7x10^{15}$ ions/cm^2 for Si) (see Col. 7, lines 53-67).

Re claim 6, as applied to claim 1 above, Talwar et al. teach all the claimed limitation including the limitation wherein the at least one species damages a junction formed by the dopant (i.e., the 2nd dipper amorphization implant **70** as shown in Fig. 1E damages the junction formed by dopant 50 as shown in Fig. 1C and 1D) (see Figs. 1A-1G, 2 and 3A-3C).

Re claim 9, as applied to claim 1 above, Talwar et al. teach all the claimed limitation including the limitation wherein the substrate (10) comprises at least one of <u>silicon</u>, SiGe, strained Si and strained SiGe (see Figs.1A-1G; Col. 6, lines 25-65) .

Re claim 10, as applied to claim 1 above, Talwar et al. teach all the claimed limitation including the limitation wherein the at least one species comprises at least one of Xe, Ge, Si, Ar, K.r, Ne, He and N (see Figs. 1A-1G; Col. 7, lines47-63).

Re claim 11, as applied to claim 1 above, Talwar et al. teach all the claimed limitation including the limitation wherein the dopant comprises at least one of As, P, and Sb (see Figs. 1A-1G; Col. 7, line 66 – Col. 8, line 8).

Re claim 12, as applied to claim 1 above, Talwar et al. teach all the claimed limitation including the limitation wherein the dopant is implanted at a time which is one of prior to said implanting said species, and after the implanting said species (i.e., the dopant **50** as depicted in Fig. 1C is implanted prior to the implant species **70** as depicted in Fig. 1E and the dopant **74** is implanted after the species **70** is implanted as depicted in Fig. 1E) (see Figs. 1A-1G; Col. 7, line 64 – Col. 8, line 50).

Re claim 18 as applied to claim 1 above, Talwar et al. teach all the claimed limitation including the limitation wherein said species is implanted at least about 10 to about 20 nm deeper than said dopant (i.e., the dopant **50** has a depth around <u>30 nm</u>, see Col. 7, lines 53-56, or less in the regions **40** and **44** that crated by the first species **48** as depicted in Figs. 1B and 1C, and the second species **70** create a deep doped regions as depicted in Fig.1E has depth of <u>50 nm</u>, see Col. 8, lines 34-46, and therefore, the depth of junction crated by species **70** is deeper than the dopant **50** junction depth by at least about 10 to about 20 nm) (see Figs. 1A-1G; Col. 7, line 64 – Col. 8, line 50).

Re claim 19, as applied to claim 1 above, Talwar et al. teach all the claimed limitation including the limitation wherein the species has an implantation energy (i.e., 2 KeV – 100 KeV,

see Col. 7, lines 47-64) sufficient to create a region surrounding at least a portion of an extension region in the substrate (see Figs. 1A-1G).

Re claim 20, as applied to claim 1 above, Talwar et al. teach all the claimed limitation including the limitation wherein the species has a first implantation energy sufficient to create a region surrounding at least a portion of an extension region in the substrate (see Fig. 1B), and a second implantation energy sufficient to create a region surrounding at least a portion of a source/drain region in the substrate (see Fig. 1E) (see Figs. 1A-1G; Col. 7, line 24 0 Col. 8, line 50).

Re claim 21, as applied to claim 1 above, Talwar et al. teach all the claimed limitation including the limitation wherein the species has an implantation energy sufficient to create a region surrounding at least a portion of an extension region and at least a portion of a source/drain region in said substrate (see Figs. 1A-1G; Col. 7, line 24 0 Col. 8, line 50).

Re claim 22, as applied to claim 1 above, Talwar et al. teach all the claimed limitation including the limitation wherein the annealing the substrate is performed after the implanting the dopant and the implanting said species (i.e., annealing process is performed after the spices implant **48** and **70** and dopant implant **50** and **74** is performed as depicted in Fig. 1F and 1G) (see Figs. 1A-1G; Col. 7, line 24 0 Col. 8, line 50).

Re claim 24, Talwar et al. disclose a method of forming a shallow and abrupt junction in semiconductor substrate, comprising: implanting a dopant (50) on a substrate (10) to from a dopant extension region; implanting at least one species (70) in a vicinity of the dopant in a dosage which far exceeds a preamorphization threshold of the substrate (i.e., the disclosed range $1x10^{13}$ to $1x10^{16}$ atoms/cm^2 encompasses the claimed limitations that is dose of species such as

Ge, Si, In Ar, Xe, ... exceeds 1×10^{14} ions/cm^2 for Xe and 1×10^{15} ions/cm^2 for Si, as example provided in the specification of instant application Page 14, lines 1-6) to from a region surrounding at least a portion of the dopant extension region; and annealing the substrate (10), the at least one species retarding a diffusion of the dopant during the annealing of the substrate (i.e., the implant region crated in the substrate 10 by species **48** See Fig 1B , i.e., species such as dopant Ge, Si, In, Ar, Xe, ..., the implant region crated in the substrate 10 and species **70**,see Fig. 1E, i.e., species such as Ge, Si, In, Ar, Xe, ... prohibits diffusion of the source drain dopant, i.e., B or As, into the channel region as shown in Figs 1F and 1G), such that a shallow junction (60 62) and abrupt junction (80 84) is formed (see Figs. 1A-1G; Col. 6, line 25 – Col. 10, line 63).

Re claims 25 and 35, Talwar et al. disclose a semiconductor device, comprising: a semiconductor substrate (10); a dopant formed (60 62) in said substrate (10) to define a junction; and a species formed (48 70) in a vicinity of the junction and in a concentration which far exceeds a preamorphization threshold of the substrate (10) (i.e., the disclosed range 1×10^{13} to 1×10^{16} atoms/cm^2 encompasses the claimed limitations that is dose of species such as Ge, Si, In Ar, Xe, ... exceeds 1×10^{14} ions/cm^2 for Xe and 1×10^{15} ions/cm^2 for Si, as example provided in the specification of instant application Page 14, lines 1-6) (see Figs. 1A-1G; Col. 6, line 25 – Col. 10, line 63).

Re claim 30, as applied to claim 1 above, Talwar et al. teach all the claimed limitation including the limitation wherein said substrate (10) comprises one of <u>silicon</u>, SiGe and strained Si (see Figs. 1A-1G; Col. 6, line 25 – Col. 10, line 63).

Re claim 39, as applied to claim 1 above, Talwar et al. teach all the claimed limitation including the limitation wherein said region surrounding at least.a portion of the dopant extension region (60 62) (see Figs. 1C , 3C, 5A, and 5B) is formed under the dopant extension region comprises a lip portion (i.e., an edge portion of 60 and 62) which extents along at least one side of the dopant extension (see Figs. 1A-1G; Col. 6, line 25 – Col. 10, line 63).

Re claim 40, as applied to claim 1 above, Talwar et al. teach all the claimed limitation including the limitation forming a disposable spacer (66) to mask a region where the dopant (60 62) is implanted (see Figs. 1A-1G; Col. 6, line 25 – Col. 10, line 63).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. **Claims 7, 8, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Talwar et al. (US/6,380,044).**

Re claims 7 and 8, as applied to claim 6 in Paragraph 8 above, Talwar et al. disclose all the claimed limitation including wherein junction having a depth of more than about 30 nm (i.e. 50 nm) and wherein the junction having a slope more than 5 nm per decade of charge in concentration of the dopant. In addition, Talwar et al. also disclose the amorphization depth can be optimized by selecting type dopant species, dopant energy, concentration (see Col. 7, lines 24-63) Furthermore, Talwar et al. also disclose achieving a very shallow junction having sharply defined boundary that have low sheet resistance (see Fig. 2 and Col. 10, line 56 – Col. 11, line 8).

Although Talwar et al. do not specifically disclose the claimed junction depth (i.e., no more than 30 nm) and the claimed slope (i.e., about 5 nm per decade change of concentration), such range would have been achieved within the scope of Talwar et al. disclosure by routine optimization of dopant concentration, dopant energy and type of dopant species, thereby forming a very shallow junction and a junction having the slope about 5 nm per decade change of concentration since the slope is directly proportional to the depth of the junction (i.e., slope = dX_j/dC, wherein dX_j is change in depth of the junction and dC is change in the concentration the dopant).

One of ordinary skill in the art would have been motivated to optimize the junction depth by selecting type dopant species, dopant energy, and concentration ranges by using routine experimentation in order to from a junction having depth of 30 nm or lower in the substrate so that lower slope, such as, 5 nm per decade or lower can be measured due to formation of a very shallow junction having sharply defined boundary and as result the substrate would have a very low sheet resistance.

Therefore, it would have been to one having ordinary skill in the art at the time of the invention is made to from a junction having depth of 30 nm or lower in the substrate so that lower slope such as 5 nm per decade or lower can be achieved due formation of very sallow junction, since it has been held where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." See *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); *Merck & Co. Inc. v. Biocraft Laboratories Inc.*, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989); *In re Kulling*, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990); and *In re Geisler*, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997). Furthermore, the specification contains no disclosure of either the critical nature of the claimed junction depth, i.e., no more that 30 nm and the slope 5 nm per decade of change in concentration or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. See *In re Woodruff*, 919, f.2d 1575, 1578, 16 USPQ2d, 1936 (Fed. Cir. 1990).

Re claim 29, as applied to claim 25 in Paragraph 8 above, Talwar et al. disclose all the claimed limitation including wherein junction having a depth of more than about 30 nm (i.e. 50 nm) and wherein the junction having a slope more than 5 nm per decade of charge in concentration of the dopant. In addition, Talwar et al. also disclose achieving a very shallow junction having sharply defined boundary that have low sheet resistance (see Fig. 2 and Col. 10, line 56 – Col. 11, line 8).

Although Talwar et al. do not specifically disclose the claimed junction depth (i.e., no more than 30 nm) and the claimed slope (i.e., about 5 nm per decade change of concentration), such range would have been achieved within the scope of Talwar et al. disclosure by routine optimization of dopant concentration, dopant energy and type of dopant species, thereby forming a very shallow junction and a junction having the slope about 5 nm per decade change of concentration since the slope is directly proportional to the depth of the junction (i.e., slope $=dX_j/dC$, wherein dX_j is change in depth of the junction and dC is change in the concentration the dopant).

One of ordinary skill in the art would have been motivated to optimize the junction depth by selecting type dopant species, dopant energy, and concentration ranges by using routine experimentation in order to from a junction having depth of 30 nm or lower in the substrate so that lower slope, such as, 5 nm per decade or lower can be measured due to formation of a very shallow junction having sharply defined boundary and as result the substrate would have a very low sheet resistance.

Therefore, it would have been to one having ordinary skill in the art at the time of the invention is made to from a junction having depth of 30 nm or lower in the substrate so that lower slope such as 5 nm per decade or lower can be achieved due formation of very sallow junction, since it has been held where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." See *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); *Merck & Co. Inc. v. Biocraft Laboratories Inc.*, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989); *In re Kulling*, 897

F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990); and *In re Geisler*, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997). Furthermore, the specification contains no disclosure of either the critical nature of the claimed junction depth, i.e., no more that 30 nm and the slope 5 nm per decade of change in concentration or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. See *In re Woodruff*, 919, f.2d 1575, 1578, 16 USPQ2d, 1936 (Fed. Cir. 1990).

7. **Re claims 13-17, 26, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Talwar et al. (US/6,380,044), as applied in Paragraph 5, in view of Yu (US/6,235,599).**

Re claim 13, as applied to claim 1 in Paragraph 8 above, Talwar et al. disclose all the claimed limitations including forming a source region (80) and a drain region (84) in said substrate (10) (see Figs. 1A-1G).

However, Talwar et al. do not disclose forming a metal silicide contact over said source and drain region.

Yu discloses forming a source (108) and drain (112) in the substrate (102) and forming a metal silicide contact (110 114) over the source (108) and drain (112) region (see Fig. 1). As Yu discloses the silicide contact (110 114) is formed over the source (108) and drain (112) region in order to provide low resistant contact over the source drain region.

Both Talwar et al. and Yu teachings are directed to method for fabricating MOSFET devices that includes providing a base substrate and forming a channel region in the substrate. Therefore, the teachings of Talwar et al. and Yu are analogous.

One of ordinary skill in the art would have been motivated to modify Talwar et al. teaching by forming a silicide contact in the source drain region in order to form a low resistant contact over the source drain region.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to provide Talwar et al. reference with forming a metal silicide contact over the source and drain region as taught by Yu in order to form a low resistant contact over the source drain region.

Re claim 14, as applied to claim 13 above, Talwar et al. and Yu in combination disclose all the claimed limitations including wherein said source and drain region are formed at a time which is prior to implanting of the dopant (i.e., source extension **60** drain extension **62** are formed prior to doping of species 70 as depicted in Figs. 1B-1E) (see Talwar et al. Figs. 1A-1G and Yu Fig. 1).

Re claim 15, as applied to claim 13 above, Talwar et al. and Yu in combination disclose all the claimed limitations including wherein said source and drain region are formed at a time which is after the implanting of the dopant (i.e., source extension **60** drain extension **62** are formed prior to doping of species **70** as depicted in Figs. 1B-1E or the source region **80** drain region **82** are formed after doping of species **48** as depicted on Fig. 1B and species **70** as depicted Fig. 1E).

Re claim 16, as applied to claim 14 above, Talwar et al. and Yu in combination disclose all the claimed limitations including wherein the dopant is implanted at a time which is one of prior to said implanting said species, and after said implanting said species (i.e., dopant **50** as depicted in Fig. 1C is implanted prior to implanting of species **70** as depicted in Fig. 1E and

dopant **74** is implanted after implanting of species **70** as depicted in Fig. 1E) (see Talwar et al. Figs. 1A-1G and Yu Fig. 1).

Re claim 17, as applied to claim 15 above, Talwar et al. and Yu in combination disclose all the claimed limitations including wherein the dopant is implanted at a time which is one of prior to the implanting the species, and after the implanting the species (i.e., dopant **50** as depicted in Fig. 1C is implanted prior to implanting of species **70** as depicted in Fig. 1E and dopant **74** is implanted after implanting of species **70** as depicted in Fig. 1E) (see Talwar et al. Figs. 1A-1G and Yu Fig. 1).

Re claim 26, as applied to claim 25 above in Paragraph 8, Talwar et al. teach all the claimed limitation including the limitation a source region (80) and a drain region (84) formed adjacent the dopant and the species (see Fig. 1E); a channel formed (see Fig. 1G) between said source and drain regions, a gate formed (36) over the channel (see Figs. 1A-1G)

However, Talwar et al. do not disclose a contact formed over the source and drain regions.

Yu discloses forming a source (108) and drain (112) in the substrate (102) and forming a metal silicide contact (110 114) over the source (108) and drain (112) region (see Fig. 1). As Yu discloses the silicide contact (110 114) is formed over the source (108) and drain (112) region in order to provide low resistant contact over the source drain region.

Both Talwar et al. and Yu teachings are directed to method for fabricating MOSFET devices that includes providing a base substrate and forming a channel region in the substrate. Therefore, the teachings of Talwar et al. and Yu are analogous.

One of ordinary skill in the art would have been motivated to modify Talwar et al. teaching by forming a silicide contact in the source drain region in order to form a low resistant contact over the source drain region.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to provide Talwar et al. reference with forming a metal silicide contact over the source and drain region as taught by Yu in order to form a low resistant contact over the source drain region.

Re claim 28, as applied to claim 26 above, Talwar et al. and Yu in combination teach all the claimed limitation including the limitation wherein a region of said species surrounds at least a portion of said junction, and at least a portion of said source and drain regions (see Talwar et al. Figs. 1A-1G and Yu Fig. 1).

8. **Claims 30 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Talwar et al. (US/6,380,044), as applied in Paragraph 5 above, in view of Sugawara et al. (US/2001/0003364).**

Re claim 30 and 31, as applied claim 30 in Paragraph 8 above, Talwar et al. (US/6,380,044) disclose all the claimed limitations.

However, Talwar et al. do not specifically disclose the substrate comprises SiGe and wherein said SiGe comprises one of relaxed SiGe and strained SiGe, strained SiGe comprises SiGe under one of a compressive strain and a tensile strain.

Sugawara et al. disclose the strained/relaxed SiGe substrate comprises one of compressive and tensile strain (see Page 3 Paragraph 0013). Sugawara et al. disclose due to

compressive stress generated in SiGe compound provides an increase of mobility of ions that resulted high speed in the device performance.

Both Talwar et al. and Sugawara et al. teachings are directed to method for fabricating MOSFET devices that includes providing a base substrate and forming a channel region in the substrate. Therefore, the teachings of Talwar et al. and Sugawara et al. are analogous.

One of ordinary skill in the art would have been motivated to provide a substrate comprises strained/relaxed SiGe which comprises one of compressive or tensile strain in order to increase mobility of ions so that the speed and the device performance can be increased.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to provide Talwar et al. reference with a substrate comprises strained/relaxed SiGe which comprises one of compressive or tensile strain as taught by Sugawara et al. in order to increase mobility of ions so that the speed and the device performance can be increased.

9. Re claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Talwar et al. (US/6,380,044), as applied in Paragraph 5, in view of Huang et al. (US/2004/0159834).

Re claim 33, as applied to claim 1 in Paragraph 5 above, Talwar et al. disclose all the claimed limitation including providing of a silicon substrate.

However, Talwar et al. do not specifically disclose selecting a substrate consisting from on of SiGe, strained Si, strained SiGe and relaxed SiGe.

Hung et al. disclose a method for fabricating MOSFET device that includes a strained silicon substrate (see Hung et al. Page 1, Paragraph [0004] through Paragraph [0019]). As Hung

et al. disclose strained silicon substrate provides an enhanced carrier mobility that resulted increasing performance of the semiconductor device.

Both Talwar et al. and Hung et al. teachings are directed to method for fabricating MOSFET devices that includes providing a base substrate to form the transistor. Therefore, the teachings of Talwar et al. and Hung et al. are analogous.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to provide Talwar et al. reference with a substrate selected form one of SiGe, strained Si, strained SiGe and relaxed SiGe as taught by Hung et al. in order to increase the performance of the device as result of enhanced carrier mobility.

10. **Re claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Talwar et al. (US/6,380,044), as applied in Paragraph 5, in view of Feudel et al. (US/2004/0126998).**

Re claim 38, as applied to claim 1 in Paragraph 5 above, Talwar et al. disclose all the claimed limitation including forming of the channel region adjacent to the doped extension region.

However, Talwar do not specifically disclose the channel region being a strained channel region.

Feudel et al. disclose forming of a strained channel region (see Abstract; Figs. 3a-3c, Page 2, Paragraph [0020] – [0022]). As Feudel et al. disclose formation of strain channel region (i.e., between the source/drain extension) improves channel mobility of the transistor (see Abstract).

Both Talwar et al. and Feudel et al. teachings are directed to method for fabricating MOSFET devices that includes providing a base substrate and forming a channel region in the substrate. Therefore, the teachings of Talwar et al. and Feudel et al. are analogous.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to provide Talwar et al. reference with a substrate selected form one of SiGe, strained Si, strained SiGe and relaxed SiGe as taught by Hung et al. in order to increase the performance of the device as result of enhanced carrier mobility.

Allowable Subject Matter

11. Claim 23 is allowed over prior art of record.

12. Claim 36 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

13. Applicants' arguments filed on October 12, 2004 have been fully considered but they are not persuasive.

With respect to claims 1-6, 9-12, 18-22, 24, 25, and 30, applicants argued that "Talwar does not teach or suggest *implanting at least one species, on a substrate to form a region surrounding at least a portion of said dopant extension region* as recited in claims 1, 24, 25 …In deed, the Examiner does not even allege that Talwar teaches or suggests this features …" (See applicants' argument of October 12, 2004, Pages 10-11).

In response to applicants' argument it is respectfully submitted Talwar et al. '044 teach all the claimed limitations as applied in Paragraph 5 above. For example, Fig. 1D shows P-type extensions (60 62) (i.e., dopant extension) (see Fig. 1D below).

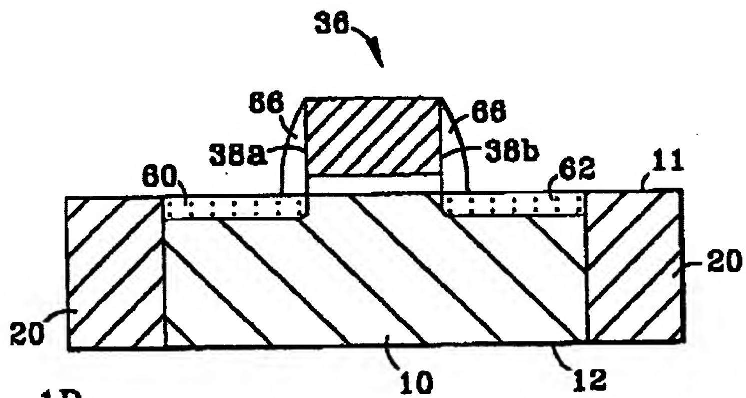

FIG. 1D

After formation of p-type extension (i.e., dopant extension), in the subsequent step heavy atom ions (I1 I2) (i.e., at least one species) are implanted into the substrate to surround "at least a portion of" the p-type extension 60 62 as shown in Fig. 1E. (see Fig. 1E below).

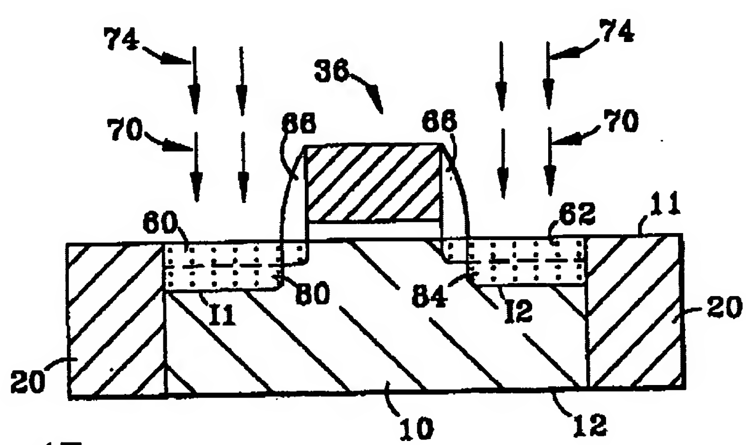

FIG. 1E

As shown above in Fig. 1E clearly, the species (I1 and I2) surround at least a portion of the dopant extension region (60 62). Hence, applicants' argument that "Talwar does not teach or suggest *implanting at least one species, on a substrate to form a region surrounding at least a portion of said dopant extension region* as recited in claims 1, 24, 25 has no merit.

Furthermore, in response to applicants' allegation that "**In deed, the Examiner does <u>not</u> even allege that Talwar teaches or suggests this features,**" it is respectfully submitted that the alleged limitations are incorporated into the claims by the amendment filed on October 12, 2004 were not claimed when the Office action of June 11, 2004 is mailed.

Claims are given their broadest reasonable interpretation in light of the supporting disclosure. See *In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027-28 (Fed. Cir. 1997). Limitations appearing in the specification but not recited in the claim are not read into the claim. See *In re Prater*, 415 F.2d 1393, 1404-05, 162 USPQ 541, 550-551 (CCPA 1969). See also *In re Zletz*, 893 F.2d 319, 321-22, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989).

Therefore, the rejection under 35 U.S.C. § 102 is deemed proper.

With respect to claim rejections under 35 U.S.C. 103, applicants' argue that that "since Talwar does not teach or suggest *implanting at least one species, on a substrate to form a region surrounding at least a portion of said dopant extension region,* and there is no motivation to modify Talwar..." (See applicants argument in Pages 12-14).

In response to applications argument, it is respectfully submitted that the combination of Talwar et al. and Yu et al. teach all the claimed limitations, as applied in Paragraph 8 above, because Talwar et al. teach all the claimed limitations of the base claim including ***implanting at least one species, on a substrate to form a region surrounding at least a portion of said dopant***

extension region. In addition, the combination of Talwar et al. and Sugawara et al., as applied in Paragraph 9 above, teach all the claimed limitations including the limitation ***implanting at least one species, on a substrate to form a region surrounding at least a portion of said dopant extension region***.

In response to applicants' arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Therefore, the *prima facie* case of obviousness has been met and the rejection under 35 U.S.C. § 103 is deemed proper.

Conclusion

14. Applicants' amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Correspondence

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brook Kebede whose telephone number is (571) 272-1862. The examiner can normally be reached on 8-5 Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (571) 272-1855. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

BK
January 7, 2005

George Fourson
Primary Examiner